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# Pulsation Damper Solves Analyzer Problem
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16. ABSTRACT

The paper describes the use of a pulsation damper to solve a severe output signal interference problem with a Beckman Model 402 Total Hydrocarbon Analyzer. The analyzer was used in a computerized data-gathering system. The problem was traced to compressions/decompressions of flow caused by the sample pump.

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| Hydrocarbons | Stationary Sources | 07C |
| Analyzers | | 14B |
| Pulsation | | 14G |
| Damping | | |
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# PULSATION DAMPER SOLVES ANALYZER PROBLEM

A vexing instrument problem consumed 80 hours of technician troubleshooting, over 100 hours of engineering time, and three months of review with the supplier. The real solution, however, was in the Operator's Manual.

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A pulsation damper was found to make the difference between the unacceptable and acceptable performance of a Beckman Model 402 Total Hydrocarbon Analyzer, at least as the analyzer was applied in a program of the U S Environmental Protection Agency's Air and Energy Engineering Research Laboratory (EPA/AEERL) in Research Triangle Park, North Carolina.

When the new model was put to work in a computerized data-gathering system, a problem was discovered: severe output signal interference, approaching ±15 percent.

Contacting the factory failed to provide a solution. Their solution was based on the presumption that the interference was electrically caused. AEERL had already tried that; it did not work.

AEERL's instrumentation personnel attempted to solve the problem, starting with the fact that the new model analyzer had a different sample pump than other models, which did not exhibit the interference. This

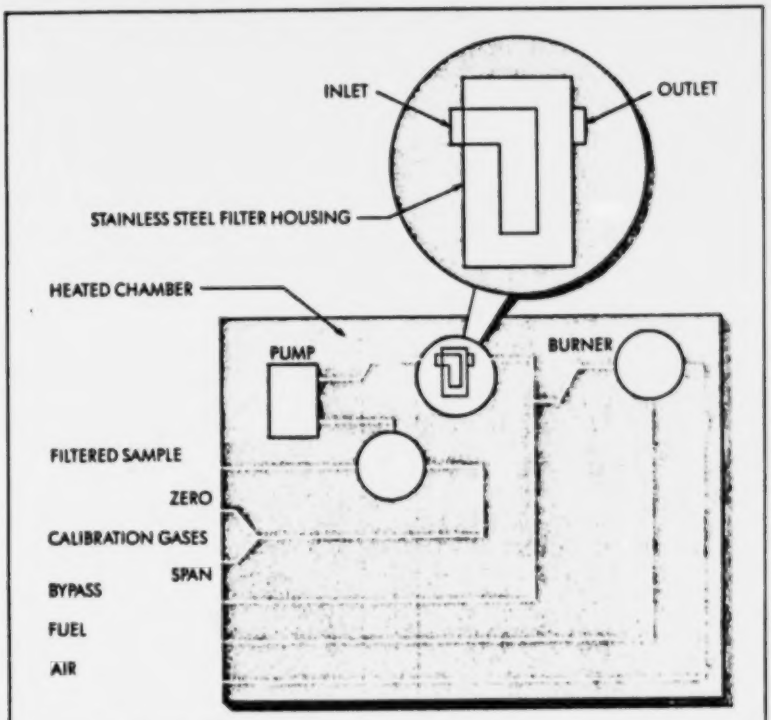


*Figure 1. Pump pulsation damper.*

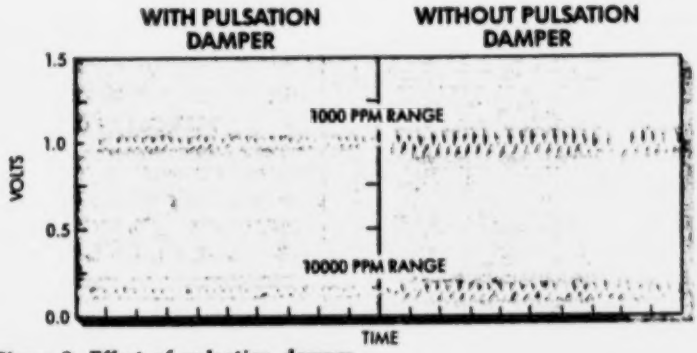


*Figure 2. Effect of pulsation damper.*

## PULSATION DAMPER *Continued*

may have been just a coincidence, but it led them to measure the frequency of the interference, first with an oscilloscope, then with a frequency counter.

Measurements showed interference of 58-59 Hz, which led them to sample pump pulsation. The coupling between the sample pump and the electric motor driving the sample pump was then disconnected. This confirmed that the interference was indeed caused by the sample pump flow pulsations: the detector was picking up the compressions/decompressions of the flow caused by the sample pump.

A large pulsation damper (35 cu in.) was installed between the sample pump and the detector. This damper reduced the interference to essentially a straight line, but also reduced the response time of the analyzer.

When a smaller pulsation damper (1.57 cu in.) was tried, it was found to reduce the interference to an acceptable ±1 percent level, within the noise level of the instrument. Furthermore this smaller pulsation damper restored the response time to acceptable limits. This pulsation damper is actually a stainless steel filter housing.

Attempting to further improve the performance of the analyzer, a 20 micron stainless steel filter element was installed inside the pulsation damper. But the filter had no influence on the analyzer output signal interference, one way or the other. This proved that volume was the solution and not filtering.

The small pulsation damper was mounted inside the heated chamber, downstream of the sample pump, as shown in Figure 1. It has been used successfully in the system which involves a computer that samples data at 2 measurements per second, without increasing the response time within the data sampling time frame.

Operation with and without the pulsation damper is shown in Figure 2. The upper line is data taken in the 1000 ppm range, while the lower line is data taken in the 10000 ppm range.

A special thanks to Paul M Lemieux of AEERL's Combustion Research Branch for his assistance. IT